Claims

1. A diaphragm pump housing comprising:

a) a first component and a second component, each component having first and second connection interfaces that are inclined relative to one another;

b) an interior pump chamber;

c) an exterior pressure port and an exterior vacuum port;

d) interior fluid communication channels connecting said exterior ports with said interior chamber; and,

e) means for locking said first component to said second component with said first and second connection interfaces in overlapping contact with one another.

2. The housing recited in claim 1, wherein said first and second components and said locking means can be hand assembled.

3. The housing recited in claim 2, wherein said locking means comprises a cover that encapsulates at least a portion of each of said first and second components.

4. The housing recited in claim 2, wherein said locking means comprises clips that clamp said first and second components together.

5. The housing recited in claim 1, wherein said locking means is integrally formed on at least one of said first and second components so that said components are self-locking and can be hand assembled.

6. The housing recited in claim 1, wherein each of said first and second components has a plurality of exterior surfaces that form the exterior surface of said housing.

7. The housing recited in claim 6, wherein said first component includes a base, a valve block formed on one end of said base, and a first connection interface and diaphragm seat formed at the other end of said base.

8. The housing recited in claim 7, wherein said valve block includes opposed exterior side surfaces, an exterior rear surface, and a second interior connection interface.

9. The housing recited in claim 8, wherein said pressure and vacuum ports are formed on said exterior rear surface of said valve block.

10. The housing recited in claim 9, wherein said valve block includes pressure and vacuum channels extending from said pressure port and vacuum port, respectively, to said second connection interface.

11. The housing recited in claim 10, wherein said second component has a base, an interior cavity and a first connection interface formed at one end of said base, and a valve head formed at the other end of said base.

12. The housing recited in claim 11, wherein said valve head includes a second connection interface, and pressure and vacuum channels extending through said valve block from said second connection interface to said interior cavity.

13. The housing recited in claim 12, wherein said pressure and vacuum channels of said first and second components align and form said fluid communication channels when said first and second components are assembled.

14. The housing recited in claim 1, wherein said first and second connection interfaces of said first component are oriented at an obtuse angle.

15. The housing recited in claim 1, wherein said first and second connection interfaces of said second component are arranged at an angle greater than 180 degrees.

16. The housing recited in claim 1, wherein said first component includes a mount adapted to connect a pump motor to said first component.

17. The housing recited in claim 16, wherein said pump motor mount is integrally formed with said first component.

18. The housing recited in claim 3, wherein said cover slidably engages and clamps together said first and second components.

19. The housing recited in claim 18, wherein said cover has opposed, interior, edges that engage the exterior surfaces of said first and second component.

20. The housing recited in claim 19, wherein said edges comprise tapered grooves on the interior of said cover and the exterior surfaces of said first and second components include elongate exterior edges that engage said tapered grooves.

21. The housing recited in claim 3, wherein said cover includes a snap-lock that engages said first component.

22. The housing recited in claim 21, wherein said snap lock comprises a detent protruding from an exterior side surface of said first component and a notch in said cover.

23. A diaphragm pump that can be assembled by hand, comprising:

a) a housing including: a first and a second housing component, each component having first and second connection interfaces; an interior pump chamber; an exterior pressure port; an exterior vacuum port; and fluid communication channels connecting said exterior ports with said interior chamber;

b) means for locking said first component to said second component with said first connection interfaces and said second connection interior interfaces in overlapping contact with one another;

c) a motor having a rotating output shaft, said motor being mounted on one of said housing components; and,

d) a linearly oscillating diaphragm arranged inside said housing and connected to said pump shaft.

24. The diaphragm pump recited in claim 23, wherein said first and second components and said locking means are self-locking.

25. The diaphragm pump recited in claim 24, wherein said locking means comprises a cover that slidably engages and clamps together said first and second components, and encapsulates at least a portion of said first and second components.

26. The diaphragm pump recited in claim 25, wherein said cover has opposed, tapered grooves on the interior of said cover, and the exterior surfaces of said first and second components include elongate exterior edges that engage said tapered grooves.

27. The diaphragm pump recited in claim 26, wherein said cover includes a snap-lock that engages said first component.

28. The diaphragm pump recited in claim 27, wherein said snap lock comprises a detent protruding from an exterior side surface of said first component and a notch in said cover.

29. The diaphragm pump recited in claim 24, wherein said locking means comprises clips that clamp said first and second components together.

30. The diaphragm pump recited in claim 23, wherein said locking means is integrally formed on at least one of said first and second components so that said components are self-locking.

31. The housing recited in claim 23, wherein said first and second connection interfaces are inclined relative to one another.

32. The housing recited in claim 23, including a self-locking motor mount on said first component for self-locking said motor to said housing.

33. The housing recited in claim 30, wherein said self-locking mount comprises a pair of elastically-deformable, U-shaped mounts integrally formed on said first component.

34. A diaphragm pump that can be assembled by hand, comprising:

a) a housing consisting of first and second housing components that form an interior chamber in which a diaphragm linearly oscillates along a first axis; exterior

pressure and vacuum ports having lengthwise-extending axes that are perpendicular to said first axis; and, interior fluid communication channels connecting said exterior ports with said interior chamber;

b) a motor mounted on said housing, said motor having a rotating output shaft;

c) a linearly oscillating diaphragm in said interior chamber; and,

d) a piston arm connecting said diaphragm to said pump shaft.

35. The diaphragm pump recited in claim 34, wherein said housing components are self-locking housing components.

36. The diaphragm pump recited in claim 35, wherein each housing component has first and second connection interfaces that overlap when said components are connected.

37. The diaphragm pump recited in claim 36, wherein said first and second connection interfaces of each housing component are inclined relative to one another.

38. The diaphragm pump recited in claim 34, wherein said housing further consists of means for locking said components together.

39. The diaphragm pump recited in claim 38, wherein each housing component has first and second connection interfaces that overlap when said components are connected.

40. The diaphragm pump recited in claim 39, wherein said first and second connection interfaces of each housing component are inclined relative to one another.

41. A bi-component diaphragm pump housing comprising a first component and a second component that connect along at least one planar connection interface, said components forming an interior pump chamber, exterior pressure and vacuum ports, and interior fluid communication channels connecting said exterior ports with said interior chamber, said pressure and vacuum ports having lengthwise-extending axes that define a plane that is parallel to said at least one planar interface.

42. The housing recited in claim 41, wherein said first component and second component connect along a second planar connection interface.

43. The housing recited in claim 42, wherein said first and second connection interfaces are oriented transverse to one another.

44. A method of assembling a diaphragm pump by hand from components that are self-locking, comprising the steps of:

a) providing a bi-component pump housing including first and second housing components that connect along first and second complimenting connection interfaces and form an interior pump chamber, an exterior pressure port, an exterior vacuum port, and fluid communication channels connecting said exterior ports with said interior chamber;

b) providing a motor with a rotating output shaft;

c) providing a piston assembly including a linearly reciprocating diaphragm, piston arm and bearing assembly;

d) assembling the diaphragm pump by hand by self-locking said housing components, motor, and piston assembly.

45. A diaphragm pump that can be assembled by hand, comprising:

a) a housing consisting of first and second housing components that form: an interior chamber in which an elastic diaphragm oscillates; exterior pressure and vacuum ports; and, interior fluid communication channels connecting said exterior ports with said interior chamber.

b) a linearly oscillating diaphragm in said interior chamber; and,

c) a diaphragm drive motor.

46. A pipette gun comprising:

a) a gun housing having a hand grip portion and a barrel portion oriented transverse to said hand grip portion;

b) a pipette connector fixed to and oriented transverse to said barrel portion;

c) a diaphragm pump that can be assembled by hand, comprising:

i) a housing including: a first and a second housing component, each component having first and second connection interfaces; an interior pump chamber; an exterior pressure port; an exterior vacuum port; and fluid

communication channels connecting said exterior ports with said interior chamber;

ii) means for locking said first component to said second component with said first connection interfaces and said second connection interior interfaces in overlapping contact with one another;

iii) a motor having a rotating output shaft, said motor being mounted on one of said housing components; and,

iv) a linearly oscillating diaphragm arranged inside said housing and connected to said pump shaft.

d) an internal conduit connecting said pump to said pipette connector;

e) a positive air flow trigger and a negative air flow trigger on said gun handle and connected to said pump to selectively regulate the flow of either positive air pressure or negative air pressure through said pipette connector.